

PATENT

Appl. No. 09/181,533
Amdt. dated 01/25/05
Amendment

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A miniature hearing device adapted to be positioned substantially in the ear canal of a wearer, said device comprising:
 - electrical circuit means for receiving and processing incoming signals representative of audio signals and converting them to an output for exciting the tympanic membrane of the wearer;
 - a miniature magnetically controlled miniature latchable reed switch assembly for controlling at least one of activation and deactivation of the hearing device or an operating parameter of the hearing device, said miniature reed switch assembly including:
 - a reed switch including first and second reeds providing electrical contacts spaced apart by an air gap, respective lead wires electrically connected to said first and second reeds and to said electrical circuit means; and
 - a latching magnet directly affixed to one of said first reed or the lead wire associated with said first reed, said latching magnet having a magnetic field of sufficient strength to maintain said first and second reeds together in electrical contact after said air gap is closed by an externally applied magnetic field of suitable magnitude, polarity and proximity, but of insufficient strength to bring said first and second reeds together in electrical contact while said air gap exists,
 - wherein the externally applied magnetic field is generated by a magnetic field means that is substantially located outside of the ear canal or not substantially physically engaged with the hearing device.

2. (Original) The hearing device of claim 1, wherein said latching magnet is directly affixed to said first reed.

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3. (Original) The hearing device of claim 1, wherein each of said lead wires is ferromagnetic.
4. (Original) The hearing device of claim 3, wherein said latching magnet is directly affixed to said ferromagnetic lead wire connected to said first reed.
5. (Original) The hearing device of claim 3, wherein said latching magnet is wedged between said ferromagnetic lead wires.
6. (Original) The hearing device of claim 1, wherein said reed switch is encapsulated in a hermetically sealed casing.
7. (Original) The hearing device of claim 1, wherein said reed switch assembly is positioned for remote control by a control magnet wielded by the wearer.
8. (Original) The hearing device of claim 7, including a control magnet supplied with said device and including means to prevent insertion of said control magnet into the ear canal.
9. (Original) The hearing device of claim 8, wherein said control magnet is an electromagnet.
10. (Original) The hearing device of claim 1, wherein said reed switch assembly is a power switch for activation and deactivation of said hearing device.
11. (Original) The hearing device of claim 10, wherein said reed switch assembly is connected to additionally control an operating parameter of the device.
12. (Original) The hearing device of claim 11, wherein said reed switch assembly comprises a plurality of reed switches.
13. (Original) The hearing device of claim 1, wherein said latching magnet has a protective coating.

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14. (Original) The hearing device of claim 1, wherein said reed switch assembly is protectively potted.

15. (Currently amended) A miniature hearing device adapted to fit within or to be surgically implanted adjacent to the ear canal of a human user and to be remotely controlled for powering the device on and off and/or for adjusting an operating parameter of the device to enhance the hearing of the user in response to a received incoming signal to the device representative of an audio signal, said device comprising:

a magnetically controlled miniature latchable reed switch assembly to enable the user to remotely control the device by use of an external magnet, said reed switch assembly including:

a reed switch having at least a pair of reeds spaced apart by an air gap; and

a latching magnet directly affixed to one of said reeds or to a lead wire associated therewith for holding said reeds together in electrical contact after being closed by the user's passage of said external magnet in proximity thereto, but of inadequate magnetic field strength to close said air gap without aid; whereby once said reeds are closed, the latching magnet prevents separation thereof until said reeds are exposed to an external magnetic field of sufficient strength and opposite polarity to the field of said latching magnet,

wherein the externally applied magnetic field is generated by a magnetic field means that is substantially located outside of the ear canal or not substantially physically engaged with the hearing device.

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16. (Original) The hearing device of claim 15, wherein said magnetically controlled latching reed switch assembly controls at least one of activation/ deactivation of the device and device operating parameters including adjustment of frequency response of the device to said received incoming signal representative of an audio signal and adjustment of loudness of the processed received incoming signal as output vibrations of said hearing device to a vibratory structure of the ear of the user.

17. (Previously presented) The hearing device of claim 15, further including electrical circuit means for processing the received incoming signal, and ferromagnetic lead wires connected to each reed, respectively, and to predetermined points of the electrical circuit means.

Claims 18 - 19 (Cancelled).

20. (Original) The hearing device of claim 16, wherein said reed switch assembly includes at least one additional reed switch having at least a pair of reeds spaced apart by an air gap, the first mentioned and additional reed switches being positioned for concurrent control of activation of the device and adjustment of one of said operating parameters.

21. (Currently amended) A method of remotely activating and deactivating a miniature hearing device, the method comprising the steps of:

implementing the hearing device with a miniature magnetically controlled miniature latching reed switch assembly to apply and remove battery power to the device including a reed switch having at least a pair of reeds spaced apart by an air gap and a latching magnet directly affixed to one of said reeds or to a lead wire associated therewith for holding said reeds together once closed by an external magnetic field of appropriate magnitude and polarity, but the latching magnet itself having inadequate magnetic field strength for unaided closure of said reeds spaced apart by said air gap; [[and]]

providing a control magnet means capable of generating a magnetic field of said appropriate magnitude for use by the wearer by placement in close proximity to said miniature

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reed switch assembly (i) with one polarity when the hearing device is to be activated by closing said reeds to apply battery power to the device, so that the latching magnet prevents said reeds from being subsequently separated, and (ii) with the opposite polarity when the hearing device is to be deactivated by overcoming the latching force of the latching magnet and opening said reeds to remove battery power to the device; and

activating the reed switch with the control magnet means substantially physically disengaged from the hearing device.

22. (Currently amended) The method of claim 21, further comprising:
~~including the step of~~ fashioning the control magnet means to fit near the opening of the ear for convenience of use by the wearer when the control magnet means is to be placed in close proximity to said reed switch assembly, but with a stopper to prevent the control magnet means from entering the ear canal.

23. (Currently amended) The method of claim 21, further comprising:
~~including the step of~~ fabricating the control magnet means in the form of a bar magnet having opposite polarities at its ends so that the control magnet means is conveniently inverted and placed near the ear by the wearer for powering the device on and off.

24. (Currently amended) The method of claim 21, further comprising:
~~including the step of~~ implementing said magnetically controlled latchable reed switch assembly with an additional pair of reeds spaced apart by an air gap, to enable remote control of the loudness of the output of the hearing device by use of said control magnet means by the wearer.

25. (Currently amended) The method of claim 21, further comprising:
~~including the step of~~ implementing said magnetically controlled latchable reed switch assembly with an additional pair of reeds spaced apart by an air gap, to enable remote control of the frequency response of the hearing device to received incoming signals representative of audio signals by use of said control magnet means by the wearer.

Claims 26 - 32 (Cancelled).

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33. (New) A miniature hearing device adapted to be positioned substantially in the ear canal of a wearer, said device comprising:

electrical circuit means for receiving and processing incoming signals representative of audio signals and converting them to an output for exciting the tympanic membrane of the wearer;

a miniature magnetically controlled miniature latchable reed switch assembly for controlling at least one of activation and deactivation of the hearing device or an operating parameter of the hearing device, said miniature reed switch assembly including:

a reed switch including first and second reeds providing electrical contacts spaced apart by an air gap, respective lead wires electrically connected to said first and second reeds and to said electrical circuit means; and

a latching magnet directly affixed to one of said first reed or the lead wire associated with said first reed, said latching magnet having a magnetic field of sufficient strength to maintain said first and second reeds together in electrical contact after said air gap is closed by an externally applied magnetic field of suitable magnitude, polarity and proximity, but of insufficient strength to bring said first and second reeds together in electrical contact while said air gap exists; and

wherein the reed switch is configured to be activated in the ear by the externally applied magnetic field when the external magnetic field is applied at variable directions with respect to a longitudinal axis of the reed switch.